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ABSTRACT

Metacognition refers to an individual's knowledge concerning his/her own cognitive processes. Children's metacognitive strategies were examined in a study predicated upon R.J. Spiro's hypothesis that subjects tend to reproduce (literally recall) text information in formal situations and to reconstruct (inferentially recall) it in informal situations. Twenty third graders and 20 sixth graders individually performed listening, oral reading, and silent reading tasks in both formal and informal instruction conditions. The results tended to support Spiro's hypothesis. In general, sixth graders employed metacognitive strategies that yielded reproductive comprehension in the formal condition and reconstructive comprehension in the informal condition; however, the difference in reproduction and reconstruction between instruction conditions was absent for third graders. (FL)

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Children's Metacognitive Reproductive and Reconstructive Comprehension in Listening, Reading Silently, and Reading Aloud: A Problem of Psychosocial Development

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ABSTRACT

Third and sixth graders comprehended several prose passages in three modes--listening, reading silently, and reading aloud--and in two experimental situations--formal and informal. The study was predicated upon Spiro's (1977) hypothesis that subjects will tend to reproduce text information in formal situations and will reconstruct text information in informal situations. It was reasoned that listening, reading silently, and reading aloud are modes of processing which are associated with different degrees of social formality--listening being associated with the least formal school situations, reading aloud being associated with the most formal situations. In general, sixth graders employed metacognitive strategies which yielded reproductive comprehension in the formal condition and reconstructive comprehension in the informal condition; third graders proved to be less sensitive to the formality of the testing situation. Although these findings support Spiro's hypothesis in general, several contradictions were also discovered. Tentative explanations for these contradictions are proposed.

Metacognition refers to the individual's knowledge concerning his own cognitive processes. Although the development of such self-awareness in children has become a topic of considerable interest (cf. Brown, 1977; Flavell & Wellman, 1977), there has been little research in this area focusing on metacognitive strategies children employ in comprehending printed and spoken text. Two positions have been proposed. On the one hand, there are those researchers who argue that as children develop metacognitive skills for comprehending oral language, these skills are automatically transferred to the comprehending of written language. Such an assumption is implicit in Sticht's (1972, pp. 293-294) statement that "there is only one, wholistic ability to comprehend by language, and one should be able to comprehend equally well by listening or by reading, if one has been taught to decode well and other task variables are equal." This assumption that a wholistic linguistic ability underlies all linguistic processing has further been argued for in the case of reading aloud vs. reading silently. For example, Goodman and Goodman (1977, p. 327) have claimed: ". . . a single process underlies all reading. The cycles, phases, and strategies of oral and silent reading are essentially the same."

On the other hand, there have been those researchers who have claimed that metacognitive strategies are not transferred across modalities. In short, these strategies are said to be modality specific. This point of view has been proposed as an explanation of certain reading difficulties. For example, Denner (1970) distinguishes between good and poor readers on the grounds that while good readers can apply oral-language metacognitive strategies to the comprehension of written language, poor readers cannot. Cromer (1970) has suggested that the inability of some children to draw simple inferences from reading stories results from the child's failure to apply metacognitive

semantic integration skills used in listening to the modality of reading.

Although there is a substantial research to support both positions (e.g. Sticht, 1972; Sticht, Beck, Hauke, Kleiman, & James, 1974; Mosenthal, 1977; Smiley, Oakley, Worthen, Campione, & Brown, 1977), this research has largely focused on children's use of metacognitive strategies resulting in literal, or reproductive comprehension of text. Underlying this research is the assumption that the purpose of a metacognitive comprehension strategy is to parse each sentence in an input text such that the resulting semantic interpretation in the mind mirrors the semantic interpretation in the text. The shortcoming of this research is that it has largely ignored the metacognitive reconstructive aspect of comprehension (see, however, Keeton, 1977). In the metacognitive reconstruction of text, children and adults employ explicit strategies to abstract ideas from linguistic information. This results in semantically unified conceptual schemata which often do not directly mirror the meaning of the text.

Spiro has recently suggested that metacognitive reproductive and reconstructive comprehension are a function of the social discourse situation in which one is comprehending. In sum, Spiro has proposed that the more formal, or structured, a given context for comprehending is, the more likely a person will use metacognitive strategies to reproduce the discourse material. Spiro (1977, p. 140) accounts for this effect of formal context on type of metacognitive comprehension strategy selected by observing:

> The demand characteristics of the experimental situation, the nature of the experimental materials, and the isolated context in which discourses are presented all increase the likelihood that the discourses will be maximally differentiated from pre-existing cognitive structures. The primary norm of self-preservation (Kiesler, Collins, & Miller, 1969) is

> to remember as much as possible. Any awareness by subjects that interaction with cognitive structures could lead to confusion at recall will make such interaction less likely. Furthermore, subjects tend to believe experimenters want 'pure' effects, unconfounded by one's idiosyncratic knowledge (Spiro, 1975).

In short, the more formal a given context, the more likely a person will minimize the use of available metacognitive strategies to relate new knowledge to given knowledge and, hence, the more likely a person will reproduce the discourse. The less structured the context for comprehending, the more likely a person will be to reconstruct.

These interactions between metacognitive comprehension strategies and social discourse situations can be explained as follows. In formal contexts, e.g. an experimental situation, the subject can be expected to assume that the information in the discourse is of no furture usefulness. Here the subject's intention for comprehending is to preserve the integrity of the text in order to maximize a high recognition or recall score. This stands in sharp contrast to the more general intention for comprehending, which Spiro (1977, p. 140) identifies as ". . . selectively processing information in order to update one's knowledge (that is, keeping the knowledge 'current') of issues which are personally interesting or important." Thus, the more a person's intention is to structure new knowledge according to the internal structural relations of a text, the more likely a person will use a metacognitive strategy which results in reproductive comprehending. On the other hand, the more a person's intention is to structure new knowledge according to the structure of one's given knowledge, the more likely a person will use a metacognitive strategy which results in reconstructive comprehending.

These observations can be applied as possible explanations of how children use metacognitive strategies to reproduce and reconstruct in comprehending aurally and visually. In order for a child to optionally reproduce or reconstruct, he must acquire the knowledge (or metacognitive awareness) of how to relate different intentions to comprehend to different comprehension contexts. If this is true, a plausible hypothesis is that children will use metacognitive strategies to either reconstruct or reproduce, depending upon how situationally formal they perceive listening, reading silently, and reading aloud to be. Assuming that the ability to recognize the situational appropriateness of a metacognitive strategy is acquired with age, children should thus reproduce and reconstruct differently in listening, reading silently, and reading aloud, given different levels of formality in the comprehension situation and given the level of the child's development.

A predictible difference is that although the older child may possess greater flexibility in opting to reproduce or reconstruct than a younger child, the older child will tend to reproduce more in a formal situation, given the older child's more developed awareness of the demand of the comprehension context. A concomitant prediction is that since listening is not generally associated with formally structured contexts, such as reading groups and testing for reading ability, children, depending upon their level of development, should tend to reconstruct more in listening and reproduce more in reading, the latter being more generally associated with highly structured contexts in the early grades. Furthermore, since reading aloud tends to occur in more formally structured contexts than reading silently, children should reproduce more in reading aloud and reconstruct more in in reading silently. These hypotheses were tested in the following experiment.

Method

Materials and Proposition Scoring Procedures. Twelve paragraphs were written using words from second-graders' basal readers. Each paragraph comprised a simple temporal/spatial narrative with all sentences written in the affirmative. Each paragraph contained 35 propositions. Propositions were defined as basic text concepts consisting of one relational term and one or more arguments (cf. Kintsch, 1974). An example of a stimulus paragraph is as follows:

> The cat crept out of the bushes beside the house. The cat ran through the big kitchen and climbed up the stairs. At the top of the stairs, the cat entered the bedroom. Walking along the wall, the cat discovered a chest. On top of the chest the cat discovered a pile of books. On top of the books the cat saw a small wooden box. The cat walked carefully along the edge of the chest until he had walked completely around the box. The cat jumped off the chest and went back downstairs.

In scoring children's reproduction, or literal recall, of paragraphs, children's protocols were subdivided into propositions using the same criteria used to generate propositions in the paragraphs. If a child's proposition was either a literal or synonymous match with a proposition in the stimulus analysis, a score of "one" was awarded. Children's total score for literal proposition recall reflected the total number of literal or synonymous propositions matching the propositions specified in the stimulus analysis.

Because third and sixth graders in this experiment were not apt to freely recall inferences, as was determined by a pretest of the above materials, reconstruction--or inferential recall--was measured by requiring subjects to choose between true and false inferences (cf. Moeser, 1976). There were eight forced-choice

test questions for each paragraph. Examples of such questions for the above paragraph included:

1. The bedroom was at the bottom of the stairs.
2. The chest was in the kitchen.
3. A small wooden box was on top of the chest.
4. The chest was beside a wall.

Subjects. Twenty third graders and 20 sixth graders were randomly selected from three third grade classes and from four sixth grade classes respectively. Selection of all subjects was within one school located in Amsterdam, New York. The mean age of the second graders was 7 years, 8 months; the mean age of the sixth graders was 11 years, 6 months. Each subject was given a dollar for being in the experiment.

Procedure. Each subject was tested individually in a small room provided by the principal of the school. In the Formal Instructions condition, each subject was informed that he was being given a test. The test was to retell several stories to the subject's teacher, who was present at this time. The subject was further informed that this test would be used to place him within one of two reading groups: The Really Great Readers Group or the Really Stinky Readers Group. Furthermore, each subject was informed that his parents would be notified of the results of his performance on this test. In the Informal Instructions condition, each subject was told that he was to understand several stories so that he could retell these stories to a first grader, who was in the room at this time. The reasoning here was that whereas a teacher would be associated with a formal context, there would be no such association with a first grader.

For the Listening condition, paragraphs were prerecorded and presented using a tape-recorder. After two paragraphs were played, for each Instruction condition, each subject's recall was

recorded, as the subject retold the story to either the teacher or the first grader, depending upon the Instruction condition. Once the subject had completed his recall, he was given the reconstruction test. This test was presented and responded to aurally. The subject's retelling was later transcribed and scored as described earlier. The true-false test was scored as the number of inferences correctly made.

For the conditions of reading aloud and reading silently, each paragraph was typed and mimeographed, one per page. Subjects in the Silent Reading condition were instructed to read the paragraph once. In the Oral Reading conditions, subjects were instructed to read as quickly or as slowly as they desired. Except for these variations in the mode of processing procedures, the procedures for reading silently and reading aloud were the same as those for listening, under both Instruction conditions.

In order to minimize practice and content-interaction effects, the order of Instruction and Modes of Processing conditions were randomized for each subject. Paragraphs were also randomly assigned to each condition for each subject. The resulting design was a 2(Grade)x2(Instruction Type)x3(Mode of Processing) repeated measures.

Results

The first hypothesis was that children reproduce and reconstruct differently in listening, reading silently, and reading aloud given their ability to use metacognitive strategies relating intentions to comprehend to the context of comprehension. In particular, one would expect sixth graders would be more sensitive to the comprehension context than would third graders. The data

supported this hypothesis (see Table 1). For Grade 3, there was no significant difference between Reproduction, $F(1, 76)=1.30$, $p < .01$, and between Reconstruction, $F(1, 76)=2.98$, $p < .01$, in the two Instruction conditions. Also the interaction between Reproduction and Reconstruction proved insignificant, $F(1,76)=17.53$, $p < .01$, in the two Instruction conditions. For Grade 6, however, there was significant difference between Reproduction; $F(1, 76)=29.81$, $p < .01$, and Reconstruction, $F(1,76)=17.53$, $p < .01$, in the two Instruction conditions. The interaction between Reproduction and Reconstruction was also significant, $F(1, 76)=14.83$, $p < .01$. A series of Neuman-Keuls revealed the following significant differences ($p < .01$): (1) Between Silent Reading Reproduction in the Informal vs. Formal Instructions conditions, (2) between Silent Reading Reconstruction in the Informal vs. Formal Instructions conditions, (3) between Oral Reading Reproduction in the Informal vs. Formal Instructions conditions, and (4) between Oral Reading Reconstruction in Informal vs. Formal Instructions conditions. The differences between Reproduction and Reconstruction in Listening in Formal Instructions proved insignificant when compared with the respective conditions of Reproduction and Reconstruction in Listening in Informal Instructions.

In short, sixth graders' reproduction was significantly greater for Reading Aloud and Reading Silently in Formal Instructions than in Informal Instructions. Conversely, sixth graders' reconstruction was significantly greater in Informal Instructions than in Formal Instructions. For third graders, this difference in Reproduction and Reconstruction between Instruction conditions was absent. This suggests that while sixth graders are indeed sensitive to the formality of context in which they comprehend, third graders have yet to acquire this sensitivity.

The second hypothesis was that since listening is not generally associated with formally structured contexts, both third and sixth graders should reconstruct more in listening and reproduce more in reading, which is generally associated with highly structured contexts. This hypothesis was supported only in part. For Grade 3, the difference between Listening and Reading Silently and Reading Aloud proved significant, $F(5, 228) = 39.74$, $p < .01$. The interaction proved insignificant, $F(5, 228) = 1.93$, $p < .01$. A series of Neuman-Keuls revealed that in the Formal and Informal Instructions conditions both Reproduction and Reconstruction were significantly ($p < .01$) greater in Listening than in Reading Silently and Reading Aloud. This runs counter to the hypothesis which predicted that Reconstruction would have been greater in the two Reading conditions than in Listening. For Grade 6, the difference between Listening and Reading Silently and Reading Aloud also proved significant, $F(5, 228) = 33.21$, $p < .01$. The interaction here was significant, $F(5, 228) = 10.31$, $p < .01$. A series of Neuman-Keuls revealed that in Formal Instructions, Reproduction in Listening was significantly greater ($p < .01$) than Reproduction in Reading Aloud, but not significantly greater ($p < .01$) than Reproduction in Reading Silently; Reconstruction in Listening was significantly greater ($p < .01$) than Reconstruction in both Reading Silently and Reading Aloud. In Informal Instructions, Reproduction in Listening was significantly greater ($p < .01$) than Reproduction in Reading Silently and Reading Aloud; Reconstruction was significantly greater ($p < .01$) between Listening and Reading Aloud but not between Listening and Reading Silently.

In sum, these findings for Grade 6 are not in complete agreement with the stated hypothesis. Sixth graders tend to both reproduce and reconstruct more in listening than in reading

aloud under both Instruction conditions. On the other hand, sixth graders tend to reproduce equally as well in listening and reading silently in Formal Instructions but not in Informal Instructions. And conversely, sixth graders tend to reconstruct equally as well in listening and reading silently in Informal Instructions but not in Formal Instructions.

The third hypothesis was that since reading aloud tends to occur in more formally structured contexts than reading silently, children should reproduce more in reading aloud and reconstruct more in reading silently. This hypothesis was poorly supported. A series of Neuman-Keuls revealed the following patterns: In both Instruction conditions, third graders reproduced significantly more ($p < .01$) in Reading Silently than Reading Aloud. However, in both Instruction conditions, there was no significant difference between third graders' reconstruction in Reading Silently vs. Reading Aloud. These findings completely contradict the trend predicted by the hypothesis. For sixth graders, in both Instruction conditions, Reproduction and Reconstruction were both significantly greater ($p < .01$) for Reading Silently than for Reading Aloud. Here, while the trend of sixth graders' Reconstruction in Reading Silently vs. Reading Aloud is consonant with the hypothesis, the trend of sixth graders' Reproduction is not.

Discussion

A general comparison revealed that sixth graders use metacognitive strategies such that they tend to reproduce in formal situations and reconstruct in informal situations. These different strategies emerged distinctly in sixth graders' reading silently and reading aloud in Informal and Formal conditions. However, there was no difference in sixth graders' reproduction and

reconstruction in listening in either of the situational conditions. A possible explanation of this is that while sixth graders limit their metacognitive strategies to either reproducing or reconstructing in reading silently and reading aloud in a given situation, they fully employ their metacognitive strategies to comprehend wholistically--i.e. both reproducing and reconstructing--in listening in both formal and informal situations. This suggests that comprehension is not necessarily just a reconstructive or reproductive process, as Spiro (1977) has argued, but may be a combination of both processes.

That comprehension may be wholistically or partially reproductive or reconstructive is further supported by the results of within-Instructions analyses. In comparing children's reproductive and reconstructive strategies in listening and reading silently within Instructions conditions, the following results were obtained: Sixth graders reproduced equally well in listening and reading silently in Formal Instructions and reconstructed equally in listening and reading silently in Informal Instructions. On the other hand, sixth graders reproduced more in listening than in reading silently in Informal Instructions and reconstructed more in listening than in reading silently in Formal Instructions. Thus, while sixth graders employ metacognitive strategies which maximize both reproduction and reconstruction in listening in both Instruction conditions, these children use metacognitive strategies in reading silently which are selectively sensitive to the demands of the testing situation.

Analyses comparing reading aloud to listening yielded different results than did comparing reading silently to listening. In both Formal and Informal Instructions, sixth graders' reproduction and reconstruction in listening were both

greater than sixth graders' reproduction and reconstruction in reading aloud. This suggests that while particular metacognitive strategies have been transferred from listening to reading silently, these strategies have not been so transferred to reading aloud. Additional analyses revealed that sixth graders both reproduced and reconstructed more in silent reading than reading aloud. This further suggests that while metacognitive reproductive and reconstructive strategies have been transferred from listening to reading silently, these strategies have yet to be transferred to reading aloud.

In contrast to these results for sixth graders, third graders' reproduction and reconstruction appeared to be more a function of mode rather than a function of situational context. For one, the first analyses revealed that there was no significant difference between reproduction and reconstruction in the two Instruction conditions. A second series of analyses revealed that third graders reproduced and reconstructed better in listening than in reading silently or reading aloud in both Instruction conditions. A final series of analyses showed that third graders reproduced significantly more in reading silently than in reading aloud in both Instruction conditions. However, in both Instruction conditions, third graders reconstructed equally well in reading silently as in reading aloud. In sum, third graders appear not to have developed a sensitivity to the formality of the testing situation which results in a particular type of reading comprehension. In general, third graders tend to both reproduce and reconstruct the most in listening, less in reading silently, and the least in reading aloud.

In conclusion, while the difference between third graders' reproductive and reconstructive abilities appear to be a function

of the mode of processing, sixth graders' reproduction and reconstruction appear to be more a function of the situational context in which they are processing. An additional finding of this study was that mode of processing and situational context interact such that sixth graders both reproduce and reconstruct the most in listening, the least in reading aloud. However, in reading silently, sixth graders follow Spiro's (1977) prediction; they employ reproductive metacognitive strategies in formal situations and reconstructive metacognitive strategies in informal situations.

These results raise several interesting questions about the assessment of reading comprehension and about the general procedures for researching discourse. This study suggests that an important ability of a mature reader is to have a variety of metacognitive strategies available to be applied in different situational contexts. Reading comprehension tests unfortunately are usually limited to situations requiring reproductive comprehension. Such tests fail to sample a child's universe of metacognitive strategies available to him under different situational contexts. Secondly, those researchers who claim to be measuring reading ability in general by measuring the ability to read aloud in particular overlook not only the fact that reading tends to be easier in the mode of reading silently than in the mode of reading aloud, but also the fact that children tend to be more flexible in their use of metacognitive strategies in reading silently than reading aloud, given a particular situational context. In brief, tests which assess reading ability based on performances of reading aloud are not necessarily valid measures of one's ability to read silently.

The final point is in keeping with Freedle, Naus, and Schwartz's (1977) observation that research on discourse analysis

normally takes place in a "psychosocial or cognitive-social vacuum." In short, this study complements Freedle et al.'s (1977) study by demonstrating that not only is the production of prose structured relative to a given situational context, but so is the perception of prose.

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TABLE 1

Mean Number of Propositions Correctly Reproduced (Repro) and Reconstructed (Recon)

	Formal Discourse Context						Informal Discourse Context					
	Listening		Reading Silently		Reading Aloud		Listening		Reading Silently		Reading Aloud	
	Repro	Recon	Repro	Recon	Repro	Recon	Repro	Recon	Repro	Recon	Repro	Recon
Grade 3	29	7	23	4	18	2	27	9	22	5	15	3
S.D.	2.8	1.8	3.3	2.1	4.0	1.7	3.3	1.4	4.0	1.9	3.9	2.1
Grade 6	38	11	40	7	30	4	34	14	28	12	22	7
S.D.	3.6	1.9	2.9	2.3	5.8	1.5	3.8	1.9	4.1	2.7	3.5	2.9